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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN AND RELATING TO FUEL INJECTION NOZZLES FOR INTERNAL COMBUSTION ENGINES

(71) We, VEB BARKAS-WERKE IFA-KOMBINAT FUR KRAFTFAHRZEUGTEILE RENAK-WERKE, of 9 Dammsteinstrasse, Reichenbach/Vogtland, German Democratic Republic, a corporation organised under the laws of the German Democratic Rebulic, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a fuel injection nozzle for internal combustion engines, of the kind having a needle valve opened by the fuel pressure.

Known injection nozzles of this kind comprise a nozzle body and nozzle needle. Provided in the nozzle body is a conical sealing face for sealing the nozzle bore, and guide surfaces for guiding the nozzle needle. The guide surfaces between the nozzle needle and the nozzle body at the same time serve as sealing surfaces in respect of the nozzle chamber. Since the fuel pressure amounts to 200 kg/sq.cm and more, the clearance between the guide surfaces and the nozzle needle may not be more than 5 μm. This means that it is necessary to maintain the axial displacement between guide surfaces and conical sealing surface very small. The injection nozzles are secured to the nozzle holder by means of a cap nut which presses on a collar which is machined onto the nozzle body. The nozzle holder is in turn incorporated in some suitable manner into the cylinder head of the internal combustion engine.

By mounting the injection nozzle on the nozzle holder and by incorporating the nozzle holder into the cylinder head, forces act on the nozzle body which give rise to a deformation of the guide surfaces corresponding to the clearance dimensions between nozzle body and nozzle needle. In consequence, seizure of the nozzle needle arises so that a perfect seal in respect of the combustion chamber is no longer guaranteed. Thus, combustion gases penetrate the nozzle chamber and may lead to a complete failure of the injection nozzle. Differing heating of the cylinder head, nozzle holder and injection nozzle can likewise lead to deformations which correspond in their magnitude to the clearance dimensions between nozzle body and nozzle needle. It also occurs that the different deformation forces add up and so produce failure of the injection nozzle.

It has already been proposed to insert, between the collar machined into the nozzle body and the cap nut, a disc of easily flowing material in order to diminish the friction between the two parts and so reduce the rotation of the nozzle body. This arrangement makes it possible to diminish the deformations arising due to torsion, but the compression and bending deformations persist.

Furthermore, it has already been proposed to use divided nozzle bodies. The object of this is to achieve better cooling. The improved cooling results in a lessening of heat distortion. However, the deformations arising during assembly and fitting are not diminished.

The invention aims at obviating the foregoing disadvantages. The problem on which the invention is based resides in developing an injection nozzle wherein the clamping forces do not produce any deformations of the guide surfaces and the guide surfaces are cooled on all sides in order to limit heat distortion to a minimum.

Accordingly, the present invention consists in a fuel injection nozzle for internal combustion engines, comprising a nozzle body having a hollow outer part and a bush disposed inside said outer part, the bush serving for guiding a needle of a needle valve which is opened by the fuel pressure, the bush having a clearance on all sides relative to the outer part and being mounted in the outer part by means of a collar on the bush, the bush being located in its posi-

tion by one or more pins, one or more openings for receiving locking pins of a nozzle holder being provided in the collar, the said collar being secured in the outer part by screwing, pressing, shrinking or gluing.

The shape of the outer part is such that this part can be made without cutting, for example, as a dis-casting part.

Such arrangement of the nozzle parts guarantees that no forces are transmitted to the guide surfaces and the bush is flushed on all sides and thus cooled by the fuel. The axial displacements which exist are very small. Deformations due to heating and/or torsion, bending and compression no longer arise in the zone of the guide surface. Frequent failures of the nozzle due to seizure of the needle no longer occur. Furthermore, production is simplified by this arrangement, particularly by the absence of fuel supply bores.

In order that the invention may be more readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example, one embodiment thereof, and in which:—

Figure 1 is a longitudinal section through a fuel injection nozzle in accordance with the invention; and

Figure 2 is a plan view of Figure 1.

Referring to the drawings, the injection nozzle comprises a nozzle needle 10 and a nozzle body which consists of an outer part 1 and an inner part 2 which is constructed as a bush. An outlet bore 4 and a conical surface 3 are formed in the tip 5 of the outer part 1, the conical surface 3 constituting a seat for the tip of the nozzle needle 10. The bush 2 is secured in the outer part 1 by means of a collar 6. by being pressed, screwed, shrunk or glued in the outer part 1. In order to enable coaxial alignment of the bush 2 in respect of the outer part 1, the bush 2 is located in its position by one or more pins 7. A guide surface 9 for the nozzle needle 10 is provided in the bush 2. In order to prevent the guide surface 9 from being influenced by the mounting of the bush 2 by means of the collar 6, an axial recess 12 is machined into the guide surface 9 adjacent the collar 6, the length of said recess being equal to or greater than that of the collar 6. Thus, the nozzle needle 10 is only guided outside the zone of the collar 6. The bush 2 is so disposed in the outer part 1 that a clearance 11 is provided in respect of the inner wall of the outer part 1. The annular chamber formed by the clearance 11 serves as a fuel supply means to a nozzle chamber 14, the fuel simultaneously cooling the guide surface 9. The fuel enters the annular chamber 11 through slots 13. This construction avoids having additional bores through which the fuel can be conveyed. One or more further slots or bores 8 are provided in the collar 6 for receiving locking pins of a nozzle holder (not shown). From the plan view of Figure 2 it is possible to see the arrangement of slots 13 and the receiving bore 8. The face 15 formed from the end faces of the outer part 1 and the bush 2 constitutes a sealing surface for the nozzle holder. Assembly of the injection nozzle with the nozzle holder and fitting into the cylinder head are carried out in known manner. Deformations due to compression, bending, torsion or heating, which lead to seizure of the nozzle needle, no longer arise.

WHAT WE CLAIM IS:—

1. A fuel injection nozzle for internal combustion engines, comprising a nozzle body having a hollow outer part and a bush disposed inside said outer part, the bush serving for guiding a needle of a needle valve which is opened by the fuel pressure, the bush having a clearance on all sides relative to the outer part and being mounted in the outer part by means of a collar on the bush, the bush being located in its position by one or more pins, one or more openings for receiving locking pins of a nozzle holder being provided in the collar, the said collar being secured in the outer part by screwing, pressing, shrinking or gluing.

2. A fuel injection nozzle as claimed in Claim 1, wherein the bush surface which guides said valve needle has an axial recess adjacent said collar, which recess is of the same or greater length than the collar.

3. A fuel injection nozzle for internal combustion engines, substantially as herein described with reference to the accompanying drawings.

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FIG. 1

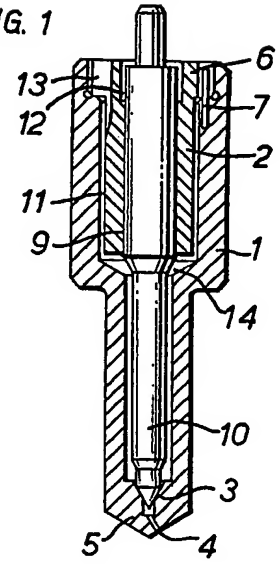

FIG. 2